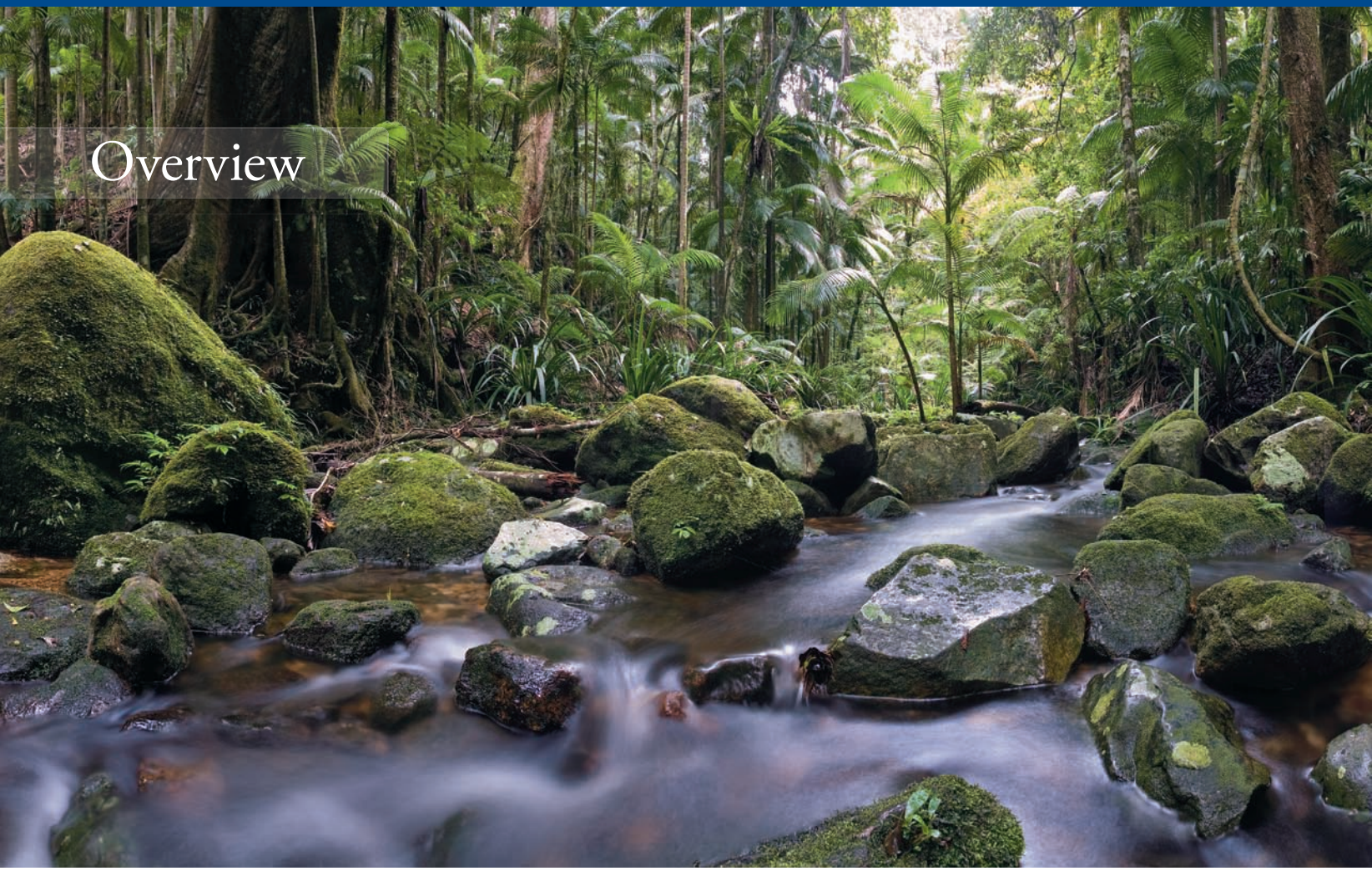
Overview

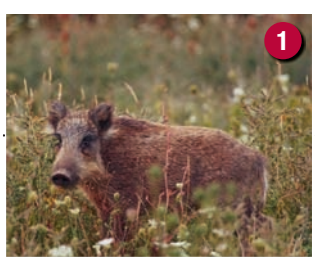


Forest stream

In this unit, *Playing the Same Role*, students apply their understanding of the roles organisms play in ecosystems to a new context—**biomes**. A biome, such as tundra, desert, or prairie, is a group of similar ecosystems. Students learn that climate and latitude determine the location and character of different biomes, as well as the plants and animals living within them. They discover that the same ecological roles exist in different biomes, even though different organisms may be filling them.

To understand the ecological roles found in all biomes, students first learn to recognize nine major biomes and identify their characteristics. They then review the cycling of nutrients and energy that is part of the functioning of healthy ecosystems. As students compare and contrast food webs and their ecological roles within biomes, they provide examples

At a Glance



A Tale of Feral Pigs
Discover how non-native pigs were introduced into California and Australia.

What Makes a Biome?
Explore biomes matching climatograms to biome descriptions.

Which Biome Do I Call Home?
Examine the vegetation and characteristics that enable plants to survive in each biome.

California Content Standard

6.5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment.

6.5.d. Students know different kinds of organisms may play similar ecological roles in similar biomes.

California Environmental Principle III

Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

Concept A: Students need to know that natural systems proceed through cycles and processes that are required for their functioning.

Concept C: Students need to know that human practices can alter the cycles and processes that operate within natural systems.

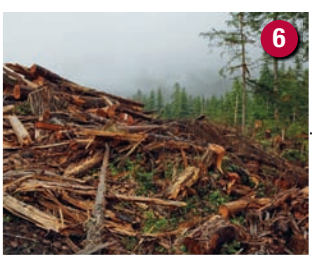
of different organisms playing similar ecological roles—producers, **herbivores**, **omnivores**, **carnivores**, and **decomposers**—in a variety of biomes.

By exploring a number of real-world examples, students come to understand that human practices influence natural cycles such as the flow of matter in food webs. As students explore the effects of human activities on various ecological roles and on the transfer of matter, they learn to explain how human practices have similar effects on organisms playing similar roles. Students expand their study of the influence of human practices by analyzing two scenarios: the influence of logging on populations and the transfer of matter in redwood forests, and the effects of irrigation practices on particular ecological roles and interactions in desert ecosystems.

Lesson 1 uses ***California Connections: A Tale of Feral Pigs—Part 1*** to introduce students to two of Earth's biomes: chaparral and savanna. Lessons 2 and 3 help students develop a global picture of Earth's terrestrial systems by categorizing areas of the continents as biomes with specific characteristics. In Lesson 4, students revisit ecological roles within the context of Earth's biomes and explore examples of different organisms playing similar roles in different biomes. Lesson 5 uses ***California Connections: A Tale of Feral Pigs—Part 2*** to show students how introduced species have similar effects on organisms that play similar roles in two different biomes. The final lesson uses case studies from two California biomes, rainforest and desert, to illustrate similarities in how other human practices influence the transfer of matter through ecosystems.

Just Playing a Role
Assemble food webs for nine terrestrial biomes and identify ecological roles within them.

Here a Pig, There a Pig…
Explore the effects of feral pigs on biomes in California and Australia.



Human Practices and the Transfer of Matter
Identify how changes to ecosystems affect the transfer of matter through foods webs.

California Connections

A Tale of Feral Pigs

Part 1

By the end of the 1700s, Spanish settlers were bringing European plants and animals to their new farms and ranches in California. One of the animals they brought was the domestic European pig. Ranchers thought pigs would be good to bring because they cost very little to feed. Pigs are omnivores, they eat both plants and animals.

California's ranchers had plenty of native oak trees on their properties. Pigs loved the acorns that fell from the oak trees. The oaks provided free food for the ranchers' pigs, and the pigs were a cheap source of food for the ranchers' families. Eventually, some of the pigs pushed through their fences and enjoyed unlimited dining in the wild chaparral of the coastal mountain range. The escaped pigs joined together and ran in large packs.

More than 100 years later, in the 1920s, a business owner named George Gordon Moore brought several wild boars from Germany to North Carolina. He had a hunting preserve in the Smoky Mountains. His friends would come from all over the country to hunt the wild boars. "You can never tell whether [the boars] will run away from you or run at you," Moore said. He decided to bring some of the strongest boars to his ranch in Carmel, California. He wanted his friends to be able to hunt the wild animals year-round.

The boars, too, escaped. When they met the packs of escaped European pigs, their genes mixed with the pigs' genes and produced what some people in California now see as a resource, and most see as a non-native pest: feral pigs. ("Feral" describes an animal that was once domesticated but is now wild.)

Feral pigs have thick, bristly coats and cloven feet, similar to deer. They sometimes have a mane of rigid hair on their backs, with short, straight tails. Male feral pigs, also called boars, have tusks that are three-to-five inches long. Females are smaller and do not have tusks.

Feral pig

Halfway around the world, settlers brought domestic pigs from England to Australia. They traveled in the late 1700s on the ships of the First Fleet. The First Fleet was a group of British ships that brought prisoners to Botany Bay, near what is now Sydney. These prisoners started the first European town in Australia. Some of the pigs that came with the Fleet escaped from Australian ranches, just as pigs had escaped in California. The feral pigs lived well in the wild savanna of northern Australia.

The chaparral and the savanna are both biological regions (biomes) that are especially good places for feral pigs to live. Chaparral has many shrubs and scrub oak. It is found along California's coast, on the slopes of Southern California's mountains, and on the western foothills of the Sierra Nevada. In the Australian savanna, thick grasses and scattered trees grow. The weather is hot and dry in the summer and rainy and mild in the winter. Both biomes have dry seasons that can last for five to seven months. When the rainy season comes, many streams and rivers overflow their banks and erode the land.

Part 2

Feral pigs have similar ecological roles in the California chaparral and the Australian savanna. In both biomes, human beings are the pigs' major predator, although coyotes in California and dingoes in Australia can kill piglets. Many hunters think feral pigs are special since they are an "exotic" animal.

Even though they can hunt feral pigs every day of the year, hunters cannot keep up with the increasing pig population. Feral pigs can give birth to up to two litters a year. Each litter may have from five to six piglets.

Pigs damage local habitat because they eat almost anything. Because there are so many of them, they can upset the ecological balance in a local area. Pigs plunge their tough, flexible snouts into the topsoil, foraging for food. This is called "rooting." Beside eating grasses and roots, they dig for worms and grubs. Worms and grubs are important members of the food web because of their role as decomposers.

The feral pig's rooting action can sometimes reach as deep as three feet. One pig can disturb an entire acre of soil in just one day. By upsetting the soil, rooting can decrease its richness. After the pigs leave an area, sometimes only the toughest weeds can grow there.

Feral pig and piglets

Because pigs cannot sweat like humans, they cool off by rolling in wet soil. This is called "wallowing." Wallowing can expose bare soils to erosion during the rainy season and foul important water sources.

Feral pigs live in over half of California's 58 counties. They feed on grasses and weeds or wildflowers in the spring. During summer and fall, they eat acorns and fruits. Throughout the year, they feed on roots, worms, grubs, birds' eggs, frogs, and lizards. However, if these food sources are not available, pigs turn to other sources for their food. A good example of this is found on Santa Cruz Island, the largest of the Channel Islands. There, these feral pigs have completely changed the food web.

Echidna

The Channel Islands are a few miles off the coast of Central and Southern California. Several plants and animals that live on the islands are endemic. This means that they cannot be found anywhere else in the world. Many years ago, pigs were introduced to several of the islands. They began rooting up native plants. The rooting caused a lot of soil erosion. It also spread weeds that are not native to the area. In a few places, the pigs even destroyed ancient Chumash Indian archaeological sites.

In the last few years, the pigs have attracted golden eagles to the island. The eagles like to eat piglets. The eagles also found that island foxes native to the island make a tasty meal. Today, less than 100 foxes remain on Santa Cruz Island. Recently, conservation groups began working to save the island fox. They decided that all pigs and golden eagles must be removed from the island so that the island fox can survive.

Many groups like those working on Santa Cruz Island are also at work in Australia. In Australia, the feral pig population is growing so fast, biologists cannot keep up with the damage the pigs cause. Today, about 4 million feral pigs run wild in the savanna, floodplains, and wetlands of northern Australia. The wild pigs eat mostly plants. They also eat small animals. The pig's diet includes grasses, leaves, fruits, nuts, berries, insects, frogs, reptiles, birds' eggs, and small mammals, including the echidna (spiny anteater). Some of these plants and animals are now endangered or extinct in areas where the pigs live. Biologists are beginning to believe that the only way to protect habitat is to remove the pigs from some areas.

Ranchers and farmers in Australia are also worried because they know that feral pigs can spread sickness to other animals. In 2001, hoof-and-mouth disease was a big problem in the United Kingdom. People were worried that the disease might come to Australia on a ship or plane. If that happened, hoof-and-mouth disease could infect the feral pigs. The sickness could spread very quickly to animals on farms and ranches. Many herds of sheep and cattle would have to be destroyed.

Feral pigs cause problems in both the California chaparral and the Australian savanna. The problems in these biomes are much the same. The existence of feral pigs in California and Australia demonstrate the costs, both to economic systems and to natural systems, of the introduction of non-native species.